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COVER: Dwarf Norway Spruce—8 years. Photo by Peter Michael Genovese.

CONTENTS

Dwarfed Potted Trees

Physiological Factors Involved in Dwarfing Trees

Little Bulbs, the Harbingers of Spring

Pitzman Nature Program

Symposium on Systematics

Book Review

Missouri Botanical Garden Programs

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DWARFED POTTED TREES

ANN KIMBALL PIPE

TREES growing as dwarfs or miniatures in our homes can be delightful and an exceedingly fascinating hobby. The art of bonsai or dwarfed potted trees is an ancient Japanese horticultural achievement developed over centuries of patient and tireless effort.

Reading the five or six books on the subject available today can be a most discouraging experience unless you have already tried your hand at dwarfing trees. If you have, you know that while it presents a challenge, it is not as difficult as it sounds. You wonder what you are getting into when you are told that the best soil for growing bonsai is a hard substratum found only in Japan and that this should be pulverized, sifted, then sorted, picking out only such grains that are "of uniform size of about one millimeter." You wonder, too, when you read that bonsai should be left outdoors all winter, if the author who lives either in Japan or California, has taken into consideration our midwestern winters. In past springs I have had a generous heap of small, dead trees to indicate he has not, and that special overwintering care must be given for our more severe conditions. These books are, of course, invaluable, and as you advance you will need to know much of the information they contain, but not necessarily from the beginning.

It is not the purpose of this article, since space is limited, to discuss fully the shaping of the tree to create beauty and the illusion of age. That is an art in itself, a matter of individual taste and experience, of the passing of many pleasant hours studying pictures of the venerable bonsai of Japan, and of considering how the natural shapes of your own trees can best be dramatized. All of this will come later, but as a start you have only to obtain a few small trees and plant them in pots. Then you must learn enough about their needs to keep them alive and healthy. This is our immediate problem.

Choosing a Tree

I know of no tree that cannot be dwarfed successfully, but since trunks and limbs become stunted more readily than do leaves, fruits and flowers, the problem will be simplified if you start with a small-leaved tree or shrub. Then, if you are a beginner, it is best to choose one that is winter hardy and will stand a fair amount of abuse. This by no means implies that such a tree is less desirable, for some of the finest ancient bonsai of Japan belong to this group.

Mrs. E. H. Pipe is an amateur bonsai enthusiast in St. Louis. Pictures with the text are taken from her collection by Peter Michael Genovese.

Trees suitable for dwarfing may be started from seed, or from cuttings or layering; they may be found in your own yard, in fields or woods (already dwarfed if you are very fortunate), or they may be purchased from nurseries, preferably in the convenient one-gallon can sizes. You will probably use several of these sources as you go along, but shopping in local nurseries offers the best opportunity for starting with a tree that can be given the appearance of a true bonsai long before the dwarfing process has developed to the point where it may accurately be given the name.

While it is not possible to list here all of the easy-to-grow varieties which may be found locally, a few of the most outstanding should be mentioned. Among the conifers I would head the list with any of the junipers which may be found in great variety in almost any nursery. Second, a little more difficult to handle but not too much so, are the hardy pines, especially the Swiss Mountain Pine *(Pinus mugo)* because of its compact habit, the Japanese Black Pine *(Pinus thunbergii)*, a popular bonsai subject for hundreds of years, or any of the hardy stone pines with their habit of growing in pleasing, angular shapes. For flowering and fruit the Firethorn *(Pyracantha)* would head the list, with its white spring flowers, its brilliant fall berries, and its very accommodating habit of living through even the most adverse conditions. Next I would name the flowering quince *(Chaenomeles)*, especially the Dwarf Japanese Quince *(C. japonica)*. Among the broadleaf evergreens, box *(Buxus)* is very easy to handle, and the Korean Box *(B. microphylla koreana)* with its very small leaves is especially attractive.

Swiss Mountain Pine 10 years. This tree was growing in a nursery eighteen months ago.

Almost any of the hardy deciduous trees grow equally well in pots, although those of suitably small size are a little more difficult to find in local nurseries than are the conifers. A taller deciduous tree may be cut back drastically in early spring, however, if you find one which branches low enough on the trunk.

Seedlings of deciduous trees such as maples, locusts, mulberries, elms and the like are readily found in a neighborhood where mature trees of the species are growing. Planting them in a corner of your garden for the first few years will speed their growth, although they should be lifted from the ground each spring, and their roots and tops trimmed back a little to keep them within bounds.

Do not limit yourself to these suggestions, however. Hunting for suitable trees is half the fun of growing bonsai, and there is no thrill quite like that of finding one, of whatever

variety, with a really unusual shape or a wonderfully gnarled and twisted trunk. The latter is of particular importance, for even though it may be all but obscured in the nursery by heavy growth, its line will be revealed as you prune and shape the branches, and will eventually become the most important feature of your tree.

Remember that even though you are starting out with a tree which is new to you, it is encouraging and not at all unusual to find good nursery specimens which are already eight or ten years old when you buy them. See, for example, the illustration of a ten-year-old Swiss Mountain Pine which was growing in a nursery only eighteen months ago. It is already well on its way to becoming a most attractive dwarfed tree, evidence that, contrary to widespread belief, it does not take a lifetime to acquire a collection of which you may be justly proud.

Potting and Root Trimming

For the first potting it is best, in some instances, not to plant your new tree in the decorative container it will eventually deserve. There are several reasons for this. 1. The container is a very important part of bonsai and should be chosen with care, keeping in mind the characteristics of the particular tree that will go into it. A tree fresh from the nursery will not show these characteristics to any but a trained eye, and until it has been pruned and shaped it is difficult to know whether a rectangular, round or oval pot will be best, or whether it should be deep or shallow. 2. A successful bonsai is one in which the fewest possible roots support the largest possible trunk and branches. A small tree which has been planted in a large, roomy container is not a bonsai at all, but merely a potted tree. If your new tree has a large root ball, it may be reduced in size more safely by a series of repottings, moving the tree to a smaller container each time. Cutting away too many unwanted roots in one operation can sometimes result in disaster. 3. If your new tree is not as large as you would like it to be, giving it a little extra growing room for a while will allow it to increase in size in a comparatively short time. In the accompanying illustration two pomegranate trees are shown, each grown from seed less than three years ago. They were grown under the same conditions, yet one is still only a few inches high because of its smaller container. In selecting a pot size, be guided by how much you want your tree to grow in the first year or two.

Pomegranate Trees from seed sown at the same time. Container sizes have controlled tree sizes.

When you have chosen a suitable pot, prepare it by covering the drainage hole with a stone or small square of aluminum screening. Then, if it is a deep one, add an inch or so of gravel to facilitate drainage. Next add a layer of potting soil which you will have prepared beforehand. A potting mixture of equal parts of sifted leafmold, topsoil and sharp sand will suit the needs of almost any tree, although there are many other recommended mixtures with which you may want to experiment later on.

Remove your tree from its container or package, choosing a protected, shady spot in which to work to prevent drying out of the roots. With a pointed stick, pick away enough of the soil so that the remaining root ball is a little smaller than the pot into which it must be fitted. Using sharp scissors, cut off the roots thus exposed. You may safely remove from one-fourth to one-third of the total root structure for this first potting. A young tree up to ten years old will tolerate more root-trimming than will an older one, and the roots of most deciduous trees may be cut back, in the proper season, even more severely.

Place the tree in its pot and fill the pot with soil, pushing it down carefully with your stick until you are sure there are no air pockets left. Then water thoroughly, several times, until moisture is seen coming through the drainage hole at the bottom. All that remains to be done to establish your tree in its new home is to protect it from the sun and wind for a few weeks.

Although the same general procedure is followed for repotting the tree when it becomes necessary in future years, it will be helpful if you understand that the primary function of root-trimming is to make possible the growing of a tree in the same container year after year without its becoming so root-bound that it will eventually starve to death. Tree growth could be controlled more readily if the roots did not have to be trimmed at all. Since the cutting off of fresh, new roots encourages rank growth, it is best, therefore, to be as selective as possible in root-trimming after the tree has reached the size and shape you would like it to maintain. With some species it is difficult to distinguish between old and new roots, but when there is an obvious choice, leave untouched as many new roots as possible, and trim off only the brown, dead ones.

If any one consideration is of paramount importance for the inexperienced grower, it is the time chosen for repotting. It is an exaggeration, but not a great one, to say that it is impossible to kill a tree by judicious trimming of its roots if it is done at the proper time, and the statement comes even closer to the truth in the case of a young, deciduous tree.

In early spring, probably in March or early April depending on the species and where it has spent the winter, examine the buds on the branches. If they show signs of swelling, with just a hint of green at the tips, tap your tree out of its pot and examine the roots. If they are crowded, winding around to follow the shape of the pot

with little soil showing, it is time for repotting.

Although most books on the subject give a rather set schedule for repotting (conifers every three to five years, deciduous two to three years, fruiting and flowering every year), there are too many factors involved to make such rules practicable. A young tree grows faster than an old one, some species faster than others, and a small or shallow container will become crowded more quickly than will a deeper one. It is best, therefore, to check each tree for its individual needs, although in the case of a slow-growing tree, a mature tree, or one in a fairly large container, this need not be done every year.

Repotting in early fall, at the start of a new growth period, is perfectly safe for some trees, and even preferable with fruit trees that bloom in early spring, but for the beginner, working with the types of trees mentioned, early spring potting is his best insurance against failure.

Some species of trees have very few fiber roots, and in such cases the soil has a tendency to fall away from the roots during transplanting. This should be avoided whenever possible, particularly in the case of a tree which is being moved from the open ground for the first time. It is far preferable to keep a ball of earth intact at the base of the trunk and to cut off the long side roots than it is to expose all the roots even though none of them are damaged in the process.

If a tree shows signs that its roots have been damaged too severely during transplanting, it may often be saved by treating it just as you would a new cutting. Plant it in sand, protect it from direct sunlight, keep it moist, not wet, and do not attempt to feed or prune it until you are sure new root growth has started. Then you may transplant it back into soil, but it still must not be fed or pruned until it has shown signs that the new roots are continuing to grow. If you find a mature, naturally dwarfed tree in the fields or woods, remember that it cannot be transplanted as easily as a nursery-grown tree. For this reason it is often wise to treat it in the above manner at first, especially if you have reason to believe its root system is not in good condition.

Watering

There is one very popular book on bonsai which gives instructions on how to plant a tree in a container with no drainage holes. My best advice is not to try this, for the importance of good drainage cannot be stressed too much. It is next to impossible to overwater a dwarfed tree in sunny, hot weather if the drainage is good, as it must be. Whether the tree in midsummer is watered once a day, or twice, or three or four times depends on the size of the container and the type of tree you are growing. If you are not at home much of the day, avoid very shallow containers; then a morning and evening watering should be sufficient. Just be sure, as you would with most other potted plants, that the soil does not remain in a dried-out condition for too many hours, for if it does, irreparable damage may be done. When you do water,

remember that one thorough soaking in hot weather is preferable to two or three light sprinklings, and that the trees will also appreciate an occasional spraying of their leaves after the sun has set.

In winter, of course, watering should be done less often; once or twice a week should be sufficient, again depending on the size of the container and the location of the tree. Water only when the soil seems to be dry, giving just enough to dampen, not soak it thoroughly.

Do not be alarmed when you read that only rain water should be used on your trees. As a Japanese friend told me when I asked about this, "There is good and better and best." Rain water is best, but accumulating it is highly impracticable for most of us, and ordinary tap water is quite good enough.

Winter and Summer Protection

Here again there is much divergence of opinion, but since our Missouri climate with its extreme heat and cold creates special problems, I have found that some protection from full summer sun, and more than the usually recommended winter protection give the best results.

Although some trees do well in our full sun, most do not. A slatted shade, with the spaces between the slats approximately equal to the width of the slats, gives about the right amount of protection. Placing the trees to receive only the morning sun, or on a bench under a large tree where they will receive dappled sunshine, is also satisfactory.

Insufficient summer protection may cause browned leaves and an unhealthy condition which is temporary and seldom fatal. Insufficient winter protection may cause such excessive loss of trees as to discourage the beginner from proceeding—which almost happened to me three winters in a row. I tried most of the recommended methods, protecting the trees using coverings of wood, plastic and burlap, or combinations of these, with one end of the benches left open to admit fresh air. I had read that the real danger was from frozen, broken pots with the resulting root damage. However, all of my pots, many of them holding dead trees, remained unbroken through the winter.

Since hardy trees must have a resting period, including a certain amount of cold weather, they cannot be kept in a warm house during the winter months. An enclosed, unheated room, however, has proved to serve the purpose very nicely. This may be inside the house, either upstairs or in the basement, an enclosed porch, or a separate building such as a shed.

If you are growing only deciduous trees, the matter of light is unimportant, but conifers and broadleaf evergreens should be placed near a window, out of the direct sun, to receive as much winter light as possible.

Except under the above conditions bonsai should never be kept indoors for long periods, but this should not discourage even apartment dwellers, some of whom have been growing certain kinds of these trees successfully in this area for years. Bring your trees indoors to enjoy them, but keep them rotating so that none will spend

more than two or three days at a time in the house.

Feeding

There are almost as many recommendations on this subject as there are bonsai growers. They range from suggestions for giving weekly summer feedings to giving no food at all. Japanese experts, who possess more knowledge and experience than most of us will ever have, usually follow the latter course when working with trees which have already reached maturity.

As with most things, the middle course seems to be the best, and until you learn from experience the requirements of your individual trees, two or three feedings a year, in spring and early fall, with an optional one in midsummer, should suffice. Trees which flower or fruit in early spring will appreciate an extra feeding in the fall. No tree should be fed immediately preceding or during its dormant period.

Almost any natural plant food will do. Diluted liquid manure, rapeseed meal, cottonseed meal, fish oil, or mixtures containing bone meal are a few of the acceptable ones. Avoid commercial fertilizers which are strong, or which tend to act quickly and may cause rank growth. No matter which food you select, remember always to feed sparingly.

A word of caution—keep in mind that plant food is a steak dinner, not a medicine, and should be given only to a good, healthy tree. One which has recently been repotted should be

Pfitzer Juniper in 1959

Same tree in 1960

Same tree in 1961

given at least a month's rest before it is fed, and food is more apt to kill than cure a sickly or diseased tree.

Pruning and Shaping

This is simply the art of encouraging your small trees to take on the appearance of their larger counterparts, and the closer the resemblance in every detail, the more successful the bonsai. Age is a most important factor in bonsai, and since none of us will ever grow a dwarfed tree a hundred or more years old, we do what we can to create the illusion of age. In studying the shape of a very old natural tree, for example, you will notice that the lower branches are usually growing either parallel to the ground or downwards, but seldom upwards as do similar branches of a tree only a few years old. Training the branches of your miniature tree to grow in the same way is a simple matter, and will do much to give the impression of advanced age.

Moss as a ground cover is an excellent means of adding illusory years to your tree, and it is not difficult to find in shady, damp areas in almost any lawn. If you find more than you have immediate need for, it may be dried, powdered and stored in jars for future use. A light sprinkling of powdered moss on the soil of a newly potted tree will soon reward you with a thick, green carpet which will not only enhance the beauty of your tree, but will serve to retain moisture and to prevent the soil from being washed away by heavy rains.

A bent or twisted trunk can be most attractive, but it should be encouraged only if the tree is of a species which would grow that way naturally. Distorted, monstrous shapes, fashionable more than a hundred years ago in Japan, are no longer considered desirable unless they reproduce the character of the adult of the particular species.

Once you have found your trees and potted them, there is no need for haste in deciding what you would like their final shapes to be. Take plenty of time, studying the best features of each, for you will want to emphasize these. Since even a dead branch may serve to add to the beauty of your tree, think twice before you prune, for a branch once removed obviously cannot be replaced.

When you are sure a branch is unwanted, cut it off as close to the trunk as possible, for an unsightly stub will mar the finished appearance of the tree. I have found that covering the large, fresh cuts with pitch is helpful not only in preventing disease from entering through the unhealed wound and in keeping the sap from bleeding through, but also in concealing the conspicuous white scar until nature has had time to cover it with a fresh layer of bark.

In changing the shape or angle of a branch do not be bound too closely by the instructions on wiring you will read as you go along. The purpose of wiring is to hold a branch in a desired position until it stays there permanently. Anything you do to this end which does not injure the tree is perfectly satisfactory. I have found, for example, that it is a simple matter, in lowering a very heavy branch, to pull it down to position by tying one end

of a length of plastic-covered wire to it, bringing the wire down under the pot, and securing the other end to the base of the trunk on the opposite side. If two branches are growing too close together, it is easier to separate them with a short stick than it is to wire them.

Scarlet Amur Maple Forest about 5 years

When wiring seems advisable, loop one end of the wire around the base of the branch, then coil it, not too tightly, around the branch all the way to the tip. Bend to the desired position.

For pruning, I find my most useful tool is a pair of ordinary nail clippers, the kind with short, curved blades and handles which spring apart automatically. With these, a small saw and a pair of garden pruning shears you will be able to make any necessary cut. A selection of rust-proof wires of various weights, wire clippers and plastic ties or stout cords will complete all the equipment you will need for this phase of the work.

Wires and ties should be left in place as long as necessary, up to about a year. A young branch will become fixed in its new position in the short time which it takes the wood to mature. A heavier branch may take six months and a very heavy one a year or more. Wires are usually removed at the end of a year even though setting of the branches may not have been completed, for if left on too long they may leave permanent ridges in the bark. A branch may be rewired if it is still necessary, but care should be taken that the new wire does not touch the wood in the same places as did the old one.

You will notice in studying the pictures of some of the best bonsai of Japan that they have needles or branches growing in dense, shapely clumps. This is achieved by constant pinching back of the tips, thus preventing the formation of long, untidy shoots. With deciduous trees this should be done all through the growing season, pinching off the tip of each new shoot to encourage it to divide and divide again, until the crown of the tree is a mass of tiny twigs. Juni-

Ginkgo biloba 87 years. Imported from Japan before World War II.

pers and other conifers which grow off and on during the spring and summer months should be treated in much the same way; the unwanted growth is taken off as it appears. Pines, however, which usually put on a whole year's growth only in spring, should be handled differently. Wait until the light green, candle-like shoots are partly open, then twist off the greater portion of each, leaving only a few needles at the base. Experience will teach you how much to remove, for you will not want to hold back the growth of a very young tree as severely as one which has already reached the desired size.

It is best to be very cautious in the use of stones, driftwood and other extraneous decorating material, for most of these serve only to detract from the tree itself. The creating of miniature scenes by the addition of small figures, houses, bridges and the like is a separate art, called *bonkei,* but in bonsai the tree is all-important and nothing should be added that will mar its beauty and simplicity. If a stone is used, it should be appropriate to the variety of tree with which it is placed. A heap of water-smoothed stones, for example, at the base of a tree normally found growing in a green meadow would be incongruous. In making decorative additions, keep in mind that too little is better than too much, and that none at all is seldom a mistake.

It is hoped that the brief points given here will start you off on a hobby that is of continuing fascination. Do not regard the loss of an occasional tree as a sign of failure. Some loss may be expected at first, the tuition fee you will pay for learning, for after you have selected and potted your trees the study of bonsai is just beginning for you. There is no such thing as a grower of bonsai who is not also a bonsai enthusiast, and since it is not possible for any one person to learn all there is to know about these small trees, there will be many years of exciting and satisfying work ahead of you.

I should like to express my indebtedness to my friend, Mr. Nonkey T. Ishiyama of McLean, Virginia, who has generously and patiently taught me, over a period of several years, much that has gone into this article.

PHYSIOLOGICAL FACTORS INVOLVED IN DWARFING TREES

Growing of dwarf trees is a remarkable problem for the theoretical botanist. It is his usual problem —how plants grow—in reverse. For it is a question as to how one can make conditions so unfavorable that the plant will grow hardly at all. Therefore I would like to comment on some of the cultural practices, which Mrs. Pipe discusses in the interesting foregoing article on bonsai trees.

For good growth one needs good soil, good nutrition, plenty of water, vigorous plants and good environmental conditions. For a bonsai tree one has to choose the opposite conditions. First, soil. Take the poorest you can get, which will not hold much

water and still less nutrients. In such a soil the plant will develop a poor rootsystem, which is important, since a large number of roots with lots of roothairs are a necessity for good growth. Therefore, severe root pruning is also a good idea to hold back growth. A plant without roots no longer grows, as demonstrated by flowers kept in a vase. It seems that roots and especially roothairs produce a hormone necessary for stem growth. Hence, the fewer roots, the less hormone and the less growth. But a plant which does not grow at all will die as soon as its leaf cells have reached their maximum age limit, which is usually about a year. Therefore one should allow enough roots on the bonsai plant to allow a minimal amount of growth.

The less water a plant gets, the less it grows, but this is difficult to control, for once the plant has severely wilted, it usually dies. But by using as little nutrition as possible, growth can also be reduced. This is the reason for using rain water instead of tap water, which has slightly more nutrients.

Perhaps the most important factor in the growth of a plant is the type of bud which is encouraged to grow. The apical bud of a branch is usually the most vigorous, and grows most rapidly. When a branch is cut, the highest buds on the stump will start to grow, and again, the larger the bud, the faster its growth. Therefore one can greatly reduce the growth of a plant by pruning off all the larger buds. Since an upright shoot grows fastest, it is possible to reduce its growth bringing it in a horizontal position, or even by bending it downward.

Finally, by keeping plants under somewhat unfavorable conditions, one can also reduce growth. This is probably one of the reasons why they develop most typically in a shaded position, and not in a greenhouse, in which they might start to grow too fast.

The final recommendation by Mrs. Pipe seems to me to be a very wise one. As I explained earlier, a good bonsai tree, which is growing very slowly, is always close to death. Therefore one cannot become a good bonsai grower without occasionally overstepping the limits of deprivation; in that way one learns how far one can go. Therefore, each dead bonsai tree is a useful, be it a sad, lesson.

FRITS W. WENT

LITTLE BULBS, THE HARBINGERS OF SPRING

PAUL A. KOHL

IT IS remarkable how quickly the early bulbous plants respond to a few warm days at the end of winter. The little bulbs, tucked away beneath ground cover plants or snow, are ready to flaunt their colors at the first breath of Spring. They are the early messengers of the colorful season which follows. Just as the glacier lilies of the mountains burst into bloom along the

receding snow line, the snowdrops are the first of the little bulbs to bloom. They are well named because in some years they are trapped, but unharmed while in flower, by a late snow. Picture records kept over a period of years indicate that although snowdrops may bloom in early February they usually make their appearance in March. They never miss a season if left undisturbed and colonies grow bigger by the increase of bulbs and by seedlings which spring up around the original plants. Ground covers of euonymus, ivy or vinca are ideal companion plants for snowdrops.

Three little blue-flowered plants closely follow the snowdrops in late March. *Scilla sibirica,* the Siberian squill, bears charming bright blue flowers on three-to four-inch stalks. The flowers of Glory-of-the-Snow, *Chionodoxa lucilliae,* are of the same shade of blue but with a central zone of white. The third member of this blue trio is *Puschkinia libanotica,* the Lebanon squill. The flowers are a soft blue with a darker stripe down the center of each petal. All of these striking blue flowers may be planted in the perennial border, the rock garden or naturalized in drifts.

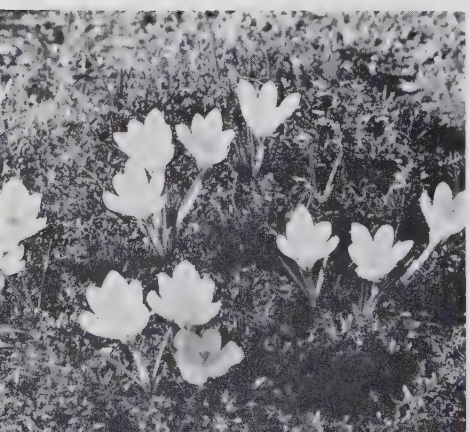
What can be more striking in early April than masses of large Dutch crocuses? One may select blue, purple, striped, white or yellow varieties or may mix them. If crocuses are not disturbed, they bloom for a number of years but are not as long lasting as the snowdrops and squills. Each year crocuses produce new corms above the old ones, like gladioli, and for that reason they gradually work their way to the surface and disappear.

Spring snowflakes, *Leucojum vernum,* resemble snowdrops but are taller and bloom in late April, thus extending the blooming period into the narcissus, hyacinth, tulip period. Bulbs planted three to four inches deep in a part of the garden where they can be left undisturbed will bloom each spring for many years without any further attention.

Beautiful clusters of blue flowers of grape hyacinths, *Muscari sp.,* appear in late April and May and bloom for a long time. These also are bulbous

White Crocus Kathleen Parlow

PHOTO BY P.A.K.



Wood Hyacinth *Scilla campanulata*

PHOTO BY P.A.K.

plants which will bloom each spring in the same location for many years.

In late April and early May we can again have scillas in the garden but this time they are the taller varieties of *Scilla campanulata* and related species. They are variously known as wood hyacinths, English and Spanish bluebells. Here we have a little trouble with plant names. Bulb catalogs list only *Scilla campanulata* as the wood hyacinth but botanical manuals, encyclopedias and garden dictionaries show *Scilla campanulata* as a synonym of *Scilla hispanica,* the Spanish bluebell. Wood hyacinths, as they are listed in catalogs, are excellent bulbs which can be naturalized and left alone for many years. Where one bulb is planted there will be a dozen or more in a few years and seedlings will spring up about the mother plants. A clump of wood hyacinths lifted in June, before the leaves disappear, will yield many round, white bulbs. These may be planted immediately or stored in a cool place and planted in the fall.

Spring-blooming bulbs are planted from October to December. Why not try some of them as they are such charming little fellows? True, they are not as spectacular as the daffodils and tulips but they have their place in the garden to usher in the spring season. They are so easy to plant, just about three inches deep in good soil and they make their growth before the trees leaf out so are not hindered by shade. There is a wide choice of varieties and colors from which to make selections in the various groups. There also are other early-blooming plants which may be planted with these bulbs. Varieties of *Iris reticulata,* species tulip, winter aconites and anemones are some of these.

Snowdrop *Galanthus nivalis*

PHOTO BY P.A.K.

Grape Hyacinth *Muscari botryoides*

PHOTO BY P.A.K.

PITZMAN NATURE PROGRAM

THE fourth summer of the Pitzman Nature Program again brought to the Garden a large number of children between the ages of 7 and 17, both from the surrounding neighborhood and from as far away as Imperial, Missouri. Approximately half of the 550 children registered for the two sessions received certificates of achievement showing that they had attended the required number of class meetings.

As in the past, four courses were offered in each of the two five-week sessions. Members of the St. Louis Audubon Society gave instruction in the class on Birds, while the other courses—Trailfinders, Plants and Man and Man's Enemies—were conducted by Kenneth Peck and two Washington University students, Pat McCue and Brian Gordon. Don Mandell joined the teaching staff for the second session. A large contribution to the success of the program was made by the Assistants' Council, a group of young people who have attended past Pitzman Nature Programs. These young people displayed amazing vigor in running errands, making preparations, in assisting children in the Trailfinders class with their problems in making leaf prints, and in getting the ink off of their hands and faces.

The classes were held each Tuesday and Thursday morning and afternoon, with a supervised lunch hour. On intervening days, selected students came in to work on special projects under the direction of the staff. Research Teams in both sessions were engaged in the following activities:

Photography.—Habits of Plant Growth was the subject. Students also developed their film and prints.

Art and Observation.—Tree profiles of well known trees were drawn. Dissections and drawings of large pickled grasshoppers were made. With the aid of a microscope, the complete life cycle of a fern was followed and drawn. Another group sketched algae from the lake in the North American tract. A glass ant house was built and ants collected to inhabit it.

Photobiology.—Two classical experiments were repeated. One demonstrated effects of different colored lights on seed germination. The other showed the phototropism exhibited by rye coleoptiles.

Herbarium Work.—Students learned how to collect, press, and mount plants. Plants collected were added to a new reference herbarium.

For some of the students it was the second, third, or even the fourth summer of participation in the Pitzman Program. The continuing interest in the program, as well as the increasing enrollment, are welcome indications that today's youngsters are still interested in the natural sciences and are willing to spend part of their summer days learning instead of passing their time aimlessly.

BRIAN GORDON

SYMPOSIUM ON SYSTEMATICS

THE Eighth Annual Symposium on Systematics will be held at the Missouri Botanical Garden on Friday and Saturday, October 20 and 21. The subject of this year's Symposium will be "The Population Concept in Systematics."

The classification of both animals and plants was, for many years, essentially the classification of museum specimens. Modern systematics, however, considers organisms as populations occurring in nature, and treats museum specimens only as samples of these natural populations. The 1961 Symposium will consider the effects of this change in viewpoint on plant and animal systematics.

The Symposium will be led by Dr. W. Frank Blair, University of Texas, and Dr. Richard W. Pohl, Iowa State University. Five invited papers will be given on different aspects of the problem as it relates to botanical and zoological systematics. The Symposium is supported by a grant from the National Science Foundation.

BOOK REVIEW

The Japanese Art of Miniature Trees and Landscapes, their Creation, Care and Enjoyment. Yuji Yoshimura and Giovanna M. Halford. Charles E. Tuttle Co., Rutland, Vermont, and Tokyo, Japan. First edition 1957, 2nd printing 1959. 220 pp. 245 plates, 25 color plates, 42 text figures.

IF THE appearance of this beautiful book does little to increase the numbers of bonsai produced and cared for in the United States it will not be the fault of the authors or the publishers. It is authoritatively written and lavishly illustrated with photographs and detailed diagrams. The senior author is the son of a bonsai conoisseur. He has a bonsai nursery in the outskirts of Tokyo and conducts classes in that exacting art. Mrs. Halford, the wife of an Englishman stationed in Japan, studied with him for two years and has written the detailed directions and discussion in a clear, direct English prose. No secrets are withheld and no mystery is made of the methods by which the dwarfing is achieved.

Some of the dwarf trees are created from naturally dwarfed specimens, carefully dug up in the mountains, transplanted to an outdoor nursery and within a year or two adapted to life as potted plants. Others start as cuttings, layerings, grafts or seedlings, though the latter naturally take much longer to produce. All of them are given daily care year after year. Few indeed will be those westerners who have the patience and the skill for this art.

In appendices at the end of the volume are: (1) descriptions of tools and equipment; (2) soil analyses; (3) detailed specifications of the individual preferences of 340 different species grown as bonzai; (4) a plant index by

English and scientific names; (5) a plant index by Chinese-Japanese characters, as well as a general index.

EDGAR ANDERSON

This book is available in the Garden Information Center, Main Gate, price $7.50.

We also have *Bonsai Miniature Trees* by Claude Chidamian, D. Van Nostrand Co., price $3.95; and *Handbook on Dwarfed Potted Trees, The Bonsai of Japan,* Brooklyn Botanic Garden, price $1.00.

MISSOURI BOTANICAL GARDEN PROGRAMS

SPECIAL SHOWS AND DISPLAYS, Budgerigar Show, October 7 and 8

FREE NATURE PROGRAMS FOR CHILDREN, aged seven and over, are held every Saturday morning from 10:00 to 11:30 A. M. Meet in the Museum Building.

October 7 Fall's Carnival
14 Fall's Frolic
21 Planting Bulbs
28 Witches' Brew

COURSES FOR ADULTS BEGINNING IN OCTOBER

107 BULBS, INDOOR-OUTDOOR—2 sessions—Fee $8.00
Tuesdays, October 3 and 10—8:00 to 9:30 P. M.
Thursdays, October 5 and 12—1:00 to 2:30 P. M.

Instruction in bulb forcing and outdoor bulb culture will be given. The Garden will supply each student with 24 top quality bulbs in 7-inch clay pans which may be taken home. The Garden will also supply cool treatment which the forced bulbs require.

207 MOSSES AND FERNS—5 sessions—Fee $10.00
Wednesday, October 4, 11, 18, 25 and November 1—8:00 to 9:30 P. M.

General instruction in mosses and ferns. Participants will learn how to identify and to recognize the common kinds. Two sessions will be field trips to be arranged in consultation with the class.

108 HOUSE PLANTS—3 sessions—Fee $6.00
Thursdays, October 5, 19 and 26—8:00 to 9:30 P. M.

General instructions in kinds of house plants, care and growing requirements such as heat, light, water and fertilizer will be discussed. Special attention will be given to individual home problems.

105 HOW TO PROPAGATE FROM CUTTTINGS—5 sessions—Fee $12.00
Tuesdays, October 17 to November 14—8:00 to 9:30 P. M.
Thursdays, October 19 to November 16—1:00 to 2:30 P. M.

Fundamental facts and procedures of producing trees, shrubs and perennials from cuttings (asexual reproduction). The Garden will supply one plastic covered metal flat, media and plant materials for 40 to 50 kinds of plants.

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SOME FACTS ABOUT SHAW'S GARDEN

The Missouri Botanical (Shaw's) Garden was established in 1859 by Henry Shaw, a St. Louis businessman, to be controlled by a Board of Trustees for the public benefit. The Garden is a non-profit institution which receives no support from the city or state, depending on the income from the Shaw estate supplemented by contributions from the public.

The old stone walls and cast-iron fences, the Linnean House, the Museum Building, the part of the Administration Building which was Shaw's Town House, relocated in the Garden in 1890, and the Tower Grove House, his country home, all date from Mr. Shaw's time. The Main Gate, display and growing greenhouses and most other facilities date from the period immediately following the turn of the century. The Climatron, opened in 1960, is the first of several new buildings planned for the Garden's redevelopment. It is the world's first geodesic dome, fully climate-controlled greenhouse and contains the Garden's tropical collections.

The Garden—70 acres—is open every day of the year from 9:00 A. M. until sundown; the greenhouses 9:00 A. M. to 5:00 P. M.; the Climatron Monday through Thursday 9:00 A. M. to 6:00 P. M., Friday through Sunday 9:00 A. M. to 10:00 P. M. (April through October); Tower Grove House is open daily from 10:00 A. M. to 4:00 P. M. (December to March on weekends only). The Display House presents four seasonal displays: November, Chrysanthemums; December, Poinsettias; February, Orchids; Spring, Lilies and other flowers. During the year are other shows, competitions and festivals sponsored by various Garden Clubs and Flower Societies.

Courses in Botany and Horticulture for adults are conducted by the Garden staff. Children's nature studies are provided each Saturday of the year and a special nature program is held during the summer. Information on these activities is published in the BULLETIN or may be had by mail or phone. The Garden maintains a research program through the Henry Shaw School of Botany, Washington University.

In 1926 an Arboretum — 1600 acres — was established at Gray Summit, Missouri. Foot trails and roads pass through the Arboretum and are open to visitors in April and May.

The Garden Administration Building is located at 2315 Tower Grove Ave., and the Garden main entrance is at Tower Grove and Flora Place. The entrance at Tower Grove and Cleveland Avenue is also open to the public. The Garden is served by both the Sarah (No. 42) and the Park-Southampton (No. 80) city bus lines.

Persons interested in helping to support the Garden and taking part in Garden activities are urged to do so through the "Friends of the Garden". Information may be obtained from the Main Gate or by mail or phone.